

Assessment of the Poster Set *Perspectives From Space*

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June 1995

1.0 Introduction

Perspectives From Space is a poster set developed by NASA for distribution to schools and school teachers. The set consists of eight distinct posters, each illustrating a new perspective that humanity has gained from space science and exploration. In addition, the set includes a teachers' guide with numerous classroom activities which is printed on the backsides of the posters, and a 4-page User's Guide.

Perspectives From Space represents one of the largest educational poster projects ever undertaken by NASA.

In developing the poster set NASA hoped that teachers would make use of the posters both for purposes of display and as a learning tool; it was especially hoped that the information and classroom activities found in the teacher's guide would be useful. In this paper we describe the results of a comprehensive assessment of the project undertaken to determine its success in meeting NASA's goals, including:

- results of numerical ratings on returned surveys
- summary of written comments from the surveys returned
- results of interviews with teachers who used the posters
- recommendations for future surveying
- recommendations for future NASA educational product design & distribution

2.0 Poster Set Distribution

NASA produced 35,000 copies of the poster set; each set of 8 posters, along with the User's Guide and return mail evaluation was packaged in a cardboard mailing tube. The following summarizes the distribution of the 35,000 *Perspectives From Space* poster sets. Numbers are rounded to the nearest 1000.

Table 1: Poster Set Distribution

Direct distribution to teachers from NASA Teacher Resource Centers	18,000
Other distribution to teachers by the NASA Education Division	7,000
Planetariums and Science Centers	1,000
Legislators (posters for distribution by NASA's Office of Legislative Affairs)	1,000
Direct Distribution to scientists and educators by each of the 8 Divisions involved in poster production (Earth Science, Solar System Exploration, Astrophysics, Space Physics, Life Sciences, Microgravity Sciences, Space Exploration, International Relations)	3,000
International Distribution: SAFISY ¹ member organizations, United Nations, "VIPs"	1,000
Special Requests (generally limited to scientists and educators)	4,000

¹SAFISY is the Space Agency Forum for International Space Year, and organization made up of space agencies, ministries, and other space organizations from around the world. *Perspectives From Space* was adopted by SAFISY as the theme for space science activities during International Space Year.

Based on a small sampling of distribution from the NASA Teacher Resource Centers, and on more complete records from other distribution lists, it is estimated that approximately three-fourths of the 35,000 poster sets are now in circulation.

Besides their general distribution, the poster set has also been used in several special displays by NASA including:

- a featured display at the 1992 World Space Congress.
- a special teacher resource evening at the National Air and Space Museum in October 1992.
- a special exhibit at the Second United Nations/ESA Workshop on Basic Space Science for the Benefit of Developing Nations held in Bogotá, Colombia in November 1992.
- an exhibit in the "NASA tent" during the 1993 "America's Reunion" Inaugural festivities on the National Mall.
- a special exhibit set-up for Congress in March 1993 by the Office of Legislative Affairs.

The posters are also on display in numerous educational institutions across the United States and internationally.

3.0 The Mail Survey

Included with the poster set was a mail survey for educators to complete and return to NASA. The intent was that the survey would be returned after the posters were used in classrooms.

The survey has 2 parts. The first 6 questions are objective questions that are directed toward finding out the relative ease with which the posters are used. The remaining questions are essay-type questions that ask educators to reflect on the posters themselves, as well as discuss any problems they encountered. There is also a question asking educators for the grade level and subject(s) they teach.

3.1 Survey Return Rate

We have received approximately 315 completed mail surveys from educators. There are approximately 25,000 poster sets in circulation. The 315 surveys that we have received represent slightly larger than a 1% return rate. In addition, at least 100 blank surveys came back to NASA. We have determined that the blanks are surveys that fell out of the mailing tubes during postal handling.

3.2 Geographical Distribution of Returned Surveys

The following table represents the distribution of responses received from within the United States:

Table 2: US Distribution of Returned Surveys

AL	7	DE	0	KS	1	MO	14	NM	3	SC	5	WI	9
AK	1	FL	7	KY	5	MS	8	NV	1	SD	2	WV	2
AR	6	GA	2	LA	4	MT	3	NY	16	TN	7	WY	2
AZ	5	HI	1	MA	5	NC	6	OH	18	TX	13	Tot	300
CA	27	IA	3	ME	0	ND	0	OK	7	UT	3		
CO	7	ID	1	MD	12	NE	6	OR	7	VA	9		
CT	2	IL	10	MI	7	NH	1	PA	13	VT	0		
DC	7	IN	6	MN	1	NJ	12	RI	2	WA	4		

The following table represents the distribution of responses received from outside the United States:

Table 3: Foreign Distribution of Returned Surveys

Australia	1	Chile	1	Mexico	1	Spain	1
Belgium	1	England	4	Portugal	1	Turkey	1
Canada	1	India	1	Puerto Rico	2	Total	15

The combined total of all responses that were able to be tallied was 315. Note that this is only 1% of the total number of poster sets distributed to date; this geographic distribution may not be indicative of the total distribution. Nevertheless, it should be gratifying to note that at least some poster sets reached teachers in at least 46 of the 50 states.

3.3 Grade Level Distribution

The following tables represents the grade levels taught by those responding to the survey.

Table 4: Grade Level of Responding Teachers

K-6	39.4%
7-8	18.3%
9-12	34.8%
College	4.9%
Other	2.7%
Total	100%

3.4 Distribution of Subjects Taught

The survey asked teachers to indicate the subject area in which they teach, by circling subjects from the following choices: Physical Science, Life Science, Earth Science, Mathematics, Language Arts, Social Studies, Art, Technology Education. In addition, an "other" option was offered, with space for writing in a subject area. Some elementary teachers checked all subjects, or wrote "all" in the "other" space; we have consolidated those into a separate category called "all listed."

Table 5: Subjects Taught by Survey Respondents

Subject	Percent	Subject	Percent
All Listed (elem)	10.3%	Other	44.6%
Art	2.6%	Aerospace	6.9%
Earth Science	38.8%	Special Education	1.1%
Language Arts	7.7%	Engineering	1.1%
Life Science	23.5%	Freelance	1.1%
Math	19.3%	Library	5.7%
Other	25%	Planetarium	9.2%
Physical Science	58.9%	Science Resource	11.5%
Social Studies	7.8%	Space Science	2.3%
Technology Educ	10.1%	Gifted/Talented	5.7%

Notice that these percentages add up to greater than 100%. Most teachers, especially Elementary School teachers, teach more than one subject.

4.0 Mail Survey Results

4.1 Objective Survey Results

The following table represents the results from the objective questions on the mail survey.

Table 6: Summary of Responses to Objective Survey Questions

SA = Strongly Agree	A = Agree	D = Disagree	SD = Strongly Disagree	SA	A	D	SD
1. I found it easy to use the posters in my classroom.				73%	24.6%	1.8%	3%
2. The posters generated interest and discussion among my students.				68.5%	30.3%	1.2%	0%
3. I found the information on the poster backsides helpful to me in understanding the subject matter of the poster sets.				72.9%	26.5%	.6%	0%
4. I found the activities on the poster backsides easy to follow and to integrate into my curriculum.				49.8%	45.7%	3.5%	.97%
5. The activities were educational for my students.				63.1%	35%	1.6%	.3%
6. The activities stimulated interest in science by my students.				62.4%	36.2%	1%	.33%

Note that more than 95% of the teachers responding indicated either “strongly agree” or “agree” to all of the questions. This indicates that teachers find it relatively easy to use the posters in their classrooms, and that the posters have proven to be beneficial in stimulating interest both among teachers and students.

4.2 Subjective Response Results

The second half of the mail survey consisted of essay-type questions that solicited teachers’ input on the usefulness of the poster set in their classroom on a more substantive level. Here we summarize the responses to each of the questions.²

²Note that in a few cases, teachers comments in one question were more relevant to another question; we have consolidated such comments where they are most appropriate to aid in interpretation.

Question 8: Which of the posters from the set did you use in your classroom? Why?

Response: The majority (79.3%) of the respondents indicated that *all* eight of the posters were used in some way. Those who only used a few of the posters in their classrooms chose them because they fit well with the material being covered at the time. Many teachers also responded that they intended to use all the posters in their classrooms; but due to the fact that some teachers did not receive the posters until after they covered the material in the classes, they either used them for display only or will use them the following school year. Many teachers said that they would rotate the posters on the wall, making sure that all of them were displayed throughout the year.

Question 9: List the activities you used with your class and briefly describe any problems you encountered.

Response: The majority of teachers indicated that they used many, or all, of the activities suggested on the backsides of the posters. A small percentage of teachers felt that the activities were too sophisticated for their students; particularly among grade levels K-2. Nevertheless, some of these teachers were able to use the activity concepts by modifying them. Difficulties cited by teachers who used the selected activities included: middle school students needed more help with the mathematics, activities too lengthy for allotted time, print and some pictures too small. A few teachers indicated that the posters and activities sparked so much interest that they created their own activities. These included: a “Night Sky Sleepover,” and the development of a Martian community. Some teachers indicated who felt the activities were too advanced for their students noted that they still used the posters to introduce topics and then proceeded with their own materials, sometimes referring back to the posters to stimulate further discussion.

Question 10: What features of the poster set did you find particularly helpful?

Response: Teachers listed a number of things about the posters they found to be especially helpful. Among the most commonly cited helpful features were:

- background information provided for each picture
- spectacular graphics and vivid colors
- the activities
- good size of the posters, clearly defined concepts
- information provided in the 4-page User’s Guide
- diversity in examples and content
- the interrelatedness of the posters
- that the set included more than just one poster
- posters bring current research into the classroom
- posters were sent without cost to the teacher or school.

Question 11: Describe how the poster set could have been improved.

Response: The vast majority of respondents indicated that they were extremely pleased with the posters as they are. The only significant comment made about improving the posters concerned the ease of use of the backsides. Approximately 70% of the teachers said it was difficult to copy the information because it was printed on the backsides, and suggested distributing the backside information in an alternative fashion. Many teachers suggested they would prefer a booklet containing the information. In addition to having the booklet, some teachers also suggested making slides of the posters, making transparencies, and blackline masters. Other than the comment about the backsides, there were only a handful of other suggestions for improvement. A few teachers suggested laminating the posters; we note, however, that this is likely to be cost prohibitive for NASA, and that most schools have access to laminators. A few teachers suggested reducing the amount of information on the posters; however, it is important to note that teachers' responses to Question 3 of the survey indicate that more than 95% were satisfied with the amount of information provided.

Question 12: Do you expect to continue using this poster set in future years

Response: One hundred percent of the teachers who responded said they would definitely use the posters again in future years. A significant number of them also indicated they would share the posters with other teachers in their schools.

Question 13: Please use the space below for additional comments.

The final question solicited any additional comments that teachers wanted to make. The most common single comment was, "Thank you!" Of significance for future NASA projects, teachers made the following suggestions:

- get materials to more teachers
- increase teacher's awareness that educational materials are available
- create versions of materials in Spanish

The box below is a sample of other comments teachers made:

Table 7: Sample Comments from Teachers

<p>"All schools should have at least 1 set!"</p> <p>"These posters are the best I've ever received from NASA."</p> <p>"Thank you very much for sending us the wonderful posters!"</p> <p>"Please add my name to the mailing list to receive future materials!"</p> <p>"This set was particularly useful because it dealt with the why's of space travel. NASA should continue to reach out to high school teachers."</p> <p>"Expand the program."</p> <p>"With budget cuts in school districts, these are great!"</p> <p>"I first ignored them and didn't appreciate them. Now I'm saying, I hope more are being planned."</p>
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5.0 Teacher Interviews

5.1 How Teachers Were Chosen and What They Were Asked

We distributed approximately 100 poster sets to teachers in the Denver Metro area. Our hope was that teachers would use the posters as soon as they received them, and be able to provide feedback in a relatively short amount of time. Teachers were chosen in cooperation with the Colorado Partnership for Educational Renewal and the various school districts around Denver. Of the 100 teachers who received the posters, only 10% of the teachers responded to our survey. We asked teachers questions about how to better inform them of educational materials developed by NASA, how the poster sets were used in their classrooms, and any suggestions they felt could make this a better poster set. While we were disappointed with the number of teachers we were able to speak to, we were not surprised. Teachers are extremely busy people, and we were grateful to those who were able to participate, as well as happy with the information they were able to provide.

5.2 Results from Interviews

As expected, the information gathered from teacher interviews were the same as what we received from the mail surveys. Teachers were overjoyed to receive the posters, and put them to good use in their classrooms. All of the teachers were able to use the posters in some way with their students. Most teachers laminated the posters and hung them in their classrooms. Some teachers used the activities on the backs of the posters, while others took what was on the back and developed their own units. We received compliments on the graphics, as well as the information provided on the backs of the posters. Teachers indicated that they would be interested in receiving more materials, such as the posters, from NASA in the future. The only improvement suggested was that the information on the backs of the posters be provided separately in either pamphlet or booklet form.

5.3 Teacher Input on Receiving Further Educational Materials

We asked teachers if they had any ideas about how NASA could make teachers aware of the existence of educational materials. Many suggested that a Teacher Resource Center near Denver would help. Currently, the closest Teacher Resource Center is located in Colorado Springs, approximately 1.5 hours from Denver. Other suggestions included a mailing list that teachers could put their names on to receive information from NASA, and an internet bulletin board that announced new materials available for teachers as well as other NASA activities that they could discuss with their students. Because of the great number of memos and letters teachers receive in their mailboxes at school, teachers were more interested in having the Teacher Resource Center and internet facilities.

6.0 Recommendations for the Future

The overwhelming response of teachers to the poster sets was extremely positive. Nevertheless, the results of surveys and interviews point to several suggestions for future NASA educational projects.

6.1 Should material be printed on the backsides of posters?

Teachers clearly and overwhelmingly indicated that they would prefer to receive the information and activities printed on the poster backsides in booklet form. This enables teachers to easily photocopy materials for their students, as well as to have a quick reference to information when using the poster activities with groups of students. Of course, one advantage of printing materials on the backsides is that it cannot be lost. Ideally, perhaps, material could be printed on both the backsides and in a booklet.

6.2 Mailing Tubes

During the course of our work, we concluded that approximately 100 mail surveys were returned to NASA blank due to the fact that the ends of the mailing tubes came off and the surveys fell out. This also means that there is a strong possibility that other information sent along with the posters, User's Guide and letter from NASA, were also lost when the ends of the tubes came off. We therefore recommend that the ends of mailing tubes always be *sealed* before mailing.

6.3 Revised Educator's Evaluation: *Perspectives From Space*

We recommend several changes to the form of the return mail evaluation. We describe each below; as an example, we have created a revised survey that could have been used for the *Perspectives From Space* evaluation, following our recommended changes, in Appendix 1.

6.3.1 Demographic Questions

We recommend moving the demographic questions to the top of the mail survey. This makes it easier to compile the information given, and keep it separate from the questions on the survey that directly deal with the posters and the information contained on them.

6.3.2 Naming and Numbering Survey Sections

By providing names and section numbers on the survey, teachers will better understand the focus of the questions. This helps them to concentrate on answering the questions appropriately. While evaluating the completed surveys, we found that teachers responses could have fit in more than one place. In order to accurately evaluate the responses, we moved answers that were more relevant to their appropriate places. By using section names to explain the purpose of the questions, we hope to eliminate this difficulty.

6.3.3 Providing More Space to Respond

In our research, we discovered that if questions on a survey are spaced too close together, it is more difficult for the respondent to read and answer them. We therefore have designed a format that gives respondents more space on the survey to write their answers and read the questions with greater ease.

6.3.4 Opportunity to Get On NASA's Mailing List

Teachers expressed a great desire to have their names put on a NASA mailing list for educational materials. Currently, there is not a good way for teachers to do this. We have designed our survey to include a space at the end for teachers to provide their names and addresses so they may be placed on such a mailing list.

6.4 Increasing the Response Rate To Return Mail Surveys

It is extremely important for NASA to receive an appropriate number of returned mail surveys in order to assess the benefits and importance of educational materials. On the average, the expected return rate for a mail survey after one mailing is approximately 25% (R & I, 1993; Hopkins & Gullickson, 1992).

Research also suggests that when a questionnaire is mailed or is taken to be filled out later, sending a follow-up postcard a few days later can bring the return rate up to about 35% (R & I, 1993; Hopkins, 1994). Then, after a few more weeks, sending a second copy of the questionnaire can increase the response rate by 10-15%. As a follow-up to the second mailing of the survey, if it is possible, telephone calls as reminders help to increase the return rate even further (R & I, 1993; Hopkins, 1994;). We received an extremely small percentage of returned mail surveys for this project. There are a few possible explanations for this.

1. The evaluation fell out of the mailing tube. Note that only a relatively small number of sets were distributed by mail; yet we received approximately 100 blank surveys. In addition to the return mail survey falling out of the mailing tube, there is a possibility that other information such as the User's Guide was also lost. Therefore, it is extremely important that the mailing tubes be *sealed* before they are distributed.
2. The survey may have been difficult to use. We have discussed improvements to the survey in a previous section of this paper.
3. Teachers ignored the extra material. Many teachers check contents and only read material that they need for classroom use; often extra materials are thrown away.
4. Survey questions were designed to be answered *after* some use. Many teachers may have intended to fill out the surveys and return them after using the posters but forgot. NASA's hope is that teachers would save the surveys and complete them after using the materials in their classrooms. However, many teachers simply returned the surveys saying they had not used the posters yet. A possible remedy is that when teachers go to the Teacher Resource Centers to pick up materials, they be asked to provide their name and current address and a note about what material they are receiving. It is critical to NASA for future projects to know who is receiving and using materials. NASA can only produce materials they know are being used by educators. Having this information is not only important for NASA, it is important for teachers to know that by supplying their names and addresses, they are ensured that they will receive information from NASA about future materials being developed for classroom use.

6.5 Are Teachers Interested in Receiving Materials from NASA?

Based on feedback from teachers, it is clear that they desire materials from NASA. A majority of teachers were previously unaware that such materials exist, or of how to get them. As materials such as the *Perspectives From Space* poster set were distributed, teachers learned of their opportunities to receive these and other educational materials. Many teachers wrote on their surveys that they are interested in

receiving other educational tools from NASA. However, there is not currently a good way for teachers to express to NASA their desire for these materials. Teachers have asked to be added to a “mailing list,” that does not exist. We discuss in this section 3 ways for teachers to communicate with NASA so they will gain available information in the best way possible.

6.5.1 Telephone Bulletin Board

We suggest that NASA set up a toll-free number for teachers. This Telephone Bulletin Board would be a valuable avenue because every teacher has access to a telephone, voice menu technology makes it easy to route callers to the information they seek, and teachers are more likely to make a toll-free call rather than spending a longer period of time to write a letter and send it via postal mail. The Telephone Bulletin Board would offer callers a voice menu of choices including, for example:

- Information about NASA educational products currently available to teachers, including instructions for obtaining educational materials by mail.
- A menu through which teachers can find the nearest Regional Teacher Resource Center to their homes.
- Short reports (e.g. 1 to 3 minutes) on recent news about the space program, such as discoveries by the Hubble Space Telescope or updates on Shuttle missions. The reports should be tailored to teachers by, for example, including suggestions on where to obtain further information and suggestions for classroom activities.
- Information about astronomical events around which teachers might build space-related classroom activities (e.g. meteor showers, eclipses, comets, and positions of the planets among the stars).

Information on the Telephone Bulletin Board should be updated regularly. To facilitate its use, NASA should seek a memorable phone number (e.g. 1-800-Fly-NASA) so that teachers will not have to refer to written information when calling.

6.5.2 Direct mail inquiry by teachers

Currently, there is no good way for teachers to communicate with NASA and get their names on a mailing list. Teachers have requested that they be added to a mailing list, yet it seems a relatively difficult list to maintain. We recommend that NASA include a postcard with all educational materials for teachers to return to add themselves to the mailing list. NASA could also include a letter explaining that to remain on the mailing list, teachers must return another postcard after a certain period of time (e.g. 2 years). These postcards would serve two purposes: first, they would keep the mailing addresses of teachers current; and second, they would let NASA know which teachers are still interested in receiving materials. It is important for NASA to distribute materials to teachers who desire them. Therefore, if teachers are responsible for returning a postcard with updated information, NASA knows who is using the educational materials it is producing.

6.5.3 Web Site

We are aware that NASA already has an excellent web page, and suggest that full advantage be taken of this resource. In particular:

- Provide teachers the ability to request materials directly and to respond to evaluations directly through this web page.
- Make all educational publications available through this site.
- Include a "usenet" bulletin board where teachers can exchange ideas about ways to use NASA educational materials and other thoughts about teaching space program related units.

We note that while relatively few schools have Internet access at present, this situation should substantially improve over the next few years. Eventually, the web site may become the primary conduit for communication between NASA and the educational community.

7.0 Conclusion

After reviewing the results from our work, we believe that this is valuable research to have done.

However, because of the difficulties associated with getting information from participating teachers, we feel that rather than spending money on the assessment of individual materials developed at NASA, it would be more productive to spend the money on developing additional materials for teachers. Due to the overwhelming request from teachers for more information, we know that they not only use the materials, but they appreciate being able to receive information for nominal or no cost. Inexpensive and valuable resources are not easily obtained. NASA is doing a wonderful job in the production, and distribution of educational materials, and this should be continued. If money is spent on assessment projects such as this one, funding for the development of other materials is reduced. We suggest that NASA concentrate on producing quality materials, and distributing them to teachers in a more efficient way such as through more centrally located Teacher Resource Centers, a telephone bulletin board system, an Internet web page, and better direct mail to individual teachers.

Appendix 1

*PERSPECTIVES FROM SPACE*Poster Set
Educator's Evaluation

If you are an educator, the National Aeronautics and Space Administration would appreciate you taking a few minutes to evaluate the *Perspectives From Space* poster set. Your feedback will be of assistance in the preparation of future educational materials.

When completed, please fold on the dotted lines, tape, and return by mail. Postage is paid within the Continental United States. We would like to thank you in advance for your feedback.

Section I: Information about the educator

1. I teach: Elementary School Middle School High School Post Secondary

2. I teach the following subjects (circle all that apply):

Physical Science Life Science Earth Science Math Language Arts
Social Studies Art Technology Ed. Physics Chemistry
Foreign Language Computer Science Other _____

Section II: This section addresses the ease with which you used the posters in your classroom

SA = Strongly Agree

A = Agree

D = Disagree

SD = Strongly Disagree

3. I found it easy to use the posters in my classroom.	SA	A	D	SD
4. The posters generated interest and discussion among my students.	SA	A	D	SD
5. I found the information on the poster backsides helpful to me in understanding the subject matter of the poster sets.	SA	A	D	SD
6. I found the activities on the poster backsides easy to follow and to integrate into my curriculum.	SA	A	D	SD
7. The activities were educational for my students.	SA	A	D	SD
8. The activities stimulated interest in science by my students.	SA	A	D	SD

Section III: The following are short answer questions that provide the opportunity for you to tell us about how you used the posters in your classroom, as well as any difficulties you encountered

9. Which of the posters from the set did you use in your classroom? Why?

10. List the activities from the posters you used with your class and briefly describe any problems you encountered.

11. What features of the poster set did you find particularly helpful?

12. Do you expect to continue using this poster set in the future?

13. Please use the space below for any additional comments.

14. If you would like to be placed on the mailing list to receive information about future materials, please provide the following information.

Name _____
Address _____
City _____ State _____ Zip Code _____

We would like to thank you for taking the time to fill out this survey. Please return it to us in the post-paid envelope.

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